

**AMENDED CLAIMS**

[received by the International Bureau on 25 April 2005 (25.04.2005);  
original claims 1-26 replaced by amended claims 1-26 (4 pages)]

1. A chimeric gene comprising the following operably linked DNA:

- (a) a plant-expressible promoter;
- (b) a DNA region which when transcribed yields a double-stranded RNA molecule capable of reducing the expression of an essential gene of a plant sap-sucking insect, said RNA molecule comprising a first and second RNA region wherein:
  - (i) said first RNA region comprises a nucleotide sequence of at least 19 consecutive nucleotides having at least about 94% sequence identity to the nucleotide sequence of said endogenous gene ;
  - (ii) said second RNA region comprises a nucleotide sequence complementary to said at least 19 consecutive nucleotides of said first RNA region;
  - (iii) said first and second RNA region are capable of base-pairing to form a double stranded RNA molecule between at least said 19 consecutive nucleotides of said first and second region;
- (c) optionally, a 3' end region comprising transcription termination and polyadenylation signals functioning in cells of said plant.

2. The chimeric gene of claim 1, wherein said essential gene of said plant sap-sucking insect is selected from the group consisting of the genes encoding the following: a gut cell protein, a membrane protein, an ecdyson receptor, a vATPase, an amino acid transporter, a transcription factor, a peptidylglycine alpha-amidating monooxygenase; a cystein protease, an aminopeptidase, a dipeptidase, a sucrase/ transglucosidase, a translation elongation factor, the eucaryotic translation initiation factor 1A, a splicing factor, an apoptosis inhibitor, a tubulin protein, an actin protein, an alpha-actinin protein, a histone, a histone deacetylase, a cell cycle regulatory protein, a cellular respiratory protein; a receptor for an insect-specific hormonal signal, a juvenile hormone receptor, an insect peptidic hormone receptor, a protein regulating ion balance in the cell, a proton-pump, a Na/K pump, an intestinal protease; an enzyme involved in sucrose metabolism, a digestive enzyme, a trypsin-like protease and a cathepsin B-like protease.

3. The chimeric gene of claims 1 or 2, wherein said double-stranded RNA silences the gene corresponding to the DNA sequence of any one of SEQ ID NO: 5 to 8, SEQ ID NO: 11 or SEQ ID NO: 12.

4. The chimeric gene of any one of claims 1 to 3, wherein between said first and second RNA region, a spacer region containing a plant intron is present.
5. The chimeric gene of any one of claim 1 to 4, wherein said essential gene has a portion which occurs with the same sequence or with at least 94 % sequence identity in homologous genes of several plant sap-sucking insects.
6. The chimeric gene of any one of claim 1 to 5, wherein said promoter is a constitutive promoter.
7. The chimeric gene of any one of claim 1 to 6, wherein said promoter is a vascular-specific or a phloem-specific promoter.
8. The chimeric gene of claim 7, wherein vascular- or phloem-specific promoter is selected from the group consisting of: the *rolC* or *rolA* promoter of *Agrobacterium rhizogenes*, the promoter of the *Agrobacterium tumefaciens* T-DNA gene 5, the rice sucrose synthase *RSs1* gene promoter, the *Commelina* yellow mottle badnavirus promoter, the coconut foliar decay virus promoter, the rice tungro bacilliform virus promoter, the promoter of the pea glutamine synthase *GS3A* gene, the *invCD111* and *invCD141* promoters of the potato invertase genes, the promoter isolated from *Arabidopsis* shown to have phloem-specific expression in tobacco by Kertbundit et al (1991), the *VAHOX1* promoter region, the pea cell wall invertase gene promoter, an acid invertase gene promoter from carrot, the promoter of the sulfate transporter gene *Sultr1;3*, the promoter of a plant sucrose synthase gene, the promoter of a plant sucrose transporter gene.
9. A plant cell, tissue, or a plant or a plant seed comprising the chimeric gene of any one of claims 1 to 8 or the double-stranded RNA molecule described in any one of claims 1 to 8.
10. A method to silence a gene of a plant sap-sucking insect, comprising applying to the feed of said plant sap-sucking insect unpackaged naked dsRNA or siRNA which is targeted to an essential plant sap-sucking gene.
11. The method of claim 10, wherein said essential gene is any of the genes listed in claim 2 above.

12. The method of claim 10, wherein said application is by expression of a dsRNA chimeric gene in phloem cells of a plant.
13. A method to silence a gene in an plant sap-sucking insect, comprising: adding naked, unpackaged dsRNA or siRNA to the diet or feed of said plant sap-sucking insect, wherein said dsRNA or siRNA targets said gene..
14. A method of controlling plant sap-sucking insects, comprising expressing in the phloem of a plant dsRNA that targets an essential plant sap-sucking insect gene.
15. The method of claim 14 wherein said gene is a gene expressed at least in the intestine or in gut cells.
16. The method of claim 14 wherein said plant sap-sucking insect is an aphid or a whitefly.
17. A plant, comprising stably inserted in its genome, the chimeric gene of claim 1, so that said chimeric gene is expressed in the phloem or xylem of said plant.
18. A method of identifying gene function in a plant sap-sucking insect, comprising the step of applying naked, unpackaged dsRNA targeting a plant sap-sucking insect gene to the diet of said insect, and evaluating phenotypic or biochemical changes in said insect.
19. A method of identification of novel targets for insecticidal compounds, comprising the steps of: a) applying naked, unpackaged dsRNA or siRNA molecules to the feed or diet of a plant-sap sucking insect; b) analyzing which genes when silenced confer lethality to said insect, c) cloning and characterizing said genes thus analyzed; d) identifying compounds that disrupt or inactivate said gene or the RNA or protein encoded thereby; and e) contacting said compounds with said insect or feed or diet of said insect to confirm the pesticidal nature of said compound.
20. Phloem of a plant, comprising siRNA targeted to an aphid essential gene.
21. Phloem sap of a plant, comprising siRNA targeted to an aphid essential gene.

22. An aphid gene comprising the sequence of any one of SEQ ID NO:5 to 8, or SEQ ID NO:12.

23. The method of claim 18 or 19, wherein a cationic oligopeptide is mixed in the diet together with the dsRNA.

24. The method of claim 23, wherein said oligopeptide is a 12 amino acids poly-Arginine peptide.

25. The plant cell, tissue, plant or plant seed of claims 9 or 17, which also comprises a chimeric gene encoding a cationic oligopeptide.

26. The plant cell, tissue, plant or plant seed of claim 25, wherein said oligopeptide is a 12 amino acids poly-Arginine peptide.